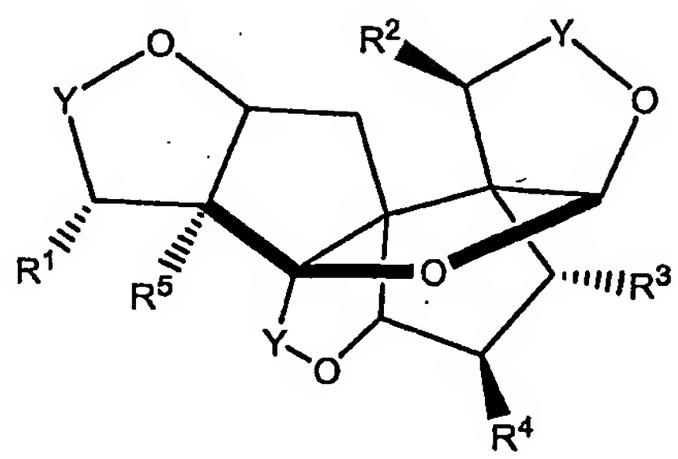
What is claimed is:

1. A compound having the formula:



(I)

or a pharmaceutically acceptable salt thereof,

wherein:

each occurrence of Y is independently $-CH_2-$ or $-C(O)-$;

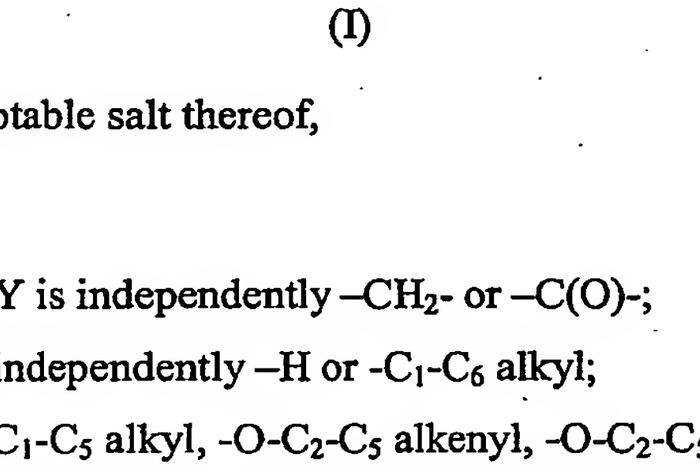
$R^1$ and $R^3$ are each independently –H or -$C_1$-$C_6$ alkyl;

$R^2$ is –H, –OH, -O-$C_1$-$C_5$ alkyl, -O-$C_2$-$C_5$ alkenyl, -O-$C_2$-$C_5$ alkynyl, -O-C(O)-$C_1$-$C_5$ alkyl, -O-C(O)-aryl, -O-CO-NH-$C_1$-$C_5$ alkyl, -O-$SO_2$-$C_1$-$C_5$ alkyl, or -O-$SO_2$-aryl;

$R^4$ is -$C_1$-$C_5$ alkyl, -$NH_2$, -halo, -$C_2$-$C_5$ alkenyl, -$C_2$-$C_5$ alkynyl, -O-$C_1$-$C_5$ alkyl, -O-$C_2$-$C_5$ alkenyl, -O-$C_2$-$C_5$ alkynyl, -O-C(O)-$C_1$-$C_5$ alkyl, -O-C(O)-aryl, –O-CO-NH-$C_1$-$C_5$ alkyl, -O-$SO_2$-$C_1$-$C_5$ alkyl, or -O-$SO_2$-aryl; and

$R^5$ is -H or –OH.

2. A composition consisting essentially of two or more structurally distinct compounds, each having the formula:



(II)

wherein:

each occurrence of Y is independently $-CH_2-$ or $-C(O)-$;

$R^1$ and $R^3$ and are each independently –H or $-C_1$-$C_6$ alkyl;

$R^1$ and $R^3$ are each independently –H or $-C_1$-$C_6$ alkyl;

$R^2$ is –H, –OH, $-O-C_1$-$C_5$ alkyl, $-O-C_2$-$C_5$ alkenyl, $-O-C_2$-$C_5$ alkynyl, $-O-C(O)-C_1$-$C_5$ alkyl, -O-C(O)-aryl, $-O-CO-NH-C_1$-$C_5$ alkyl, $-O-SO_2-C_1$-$C_5$ alkyl, or $-O-SO_2$-aryl;

$R^4$ is $-C_1$-$C_5$ alkyl, $-NH_2$, -halo, $-C_2$-$C_5$ alkenyl, $-C_2$-$C_5$ alkynyl, $-O-C_1$-$C_5$ alkyl, $-O-C_2$-$C_5$ alkenyl, $-O-C_2$-$C_5$ alkynyl, $-O-C(O)-C_1$-$C_5$ alkyl, -O-C(O)-aryl, $-O-CO-NH-C_1$-$C_5$ alkyl, $-O-SO_2-C_1$-$C_5$ alkyl, or $-O-SO_2$-aryl; and

$R^5$ is -H or –OH.

3. The composition of claim 2, wherein for at least one compound of formula (I), each occurrence of Y is $-CH_2-$.

4. The composition of claim 2, wherein for at least one compound of formula (I), each occurrence of Y is $-C(O)-$.

5. The composition of claim 2, wherein for at least one compound of formula (I), $R^1$ is $-C_1$-$C_6$ alkyl.

6. The composition of claim 5, wherein $R^1$ is methyl.

7. The composition of claim 2, wherein for at least one compound of formula (I), $R^3$ is $-C_1$-$C_6$ alkyl.

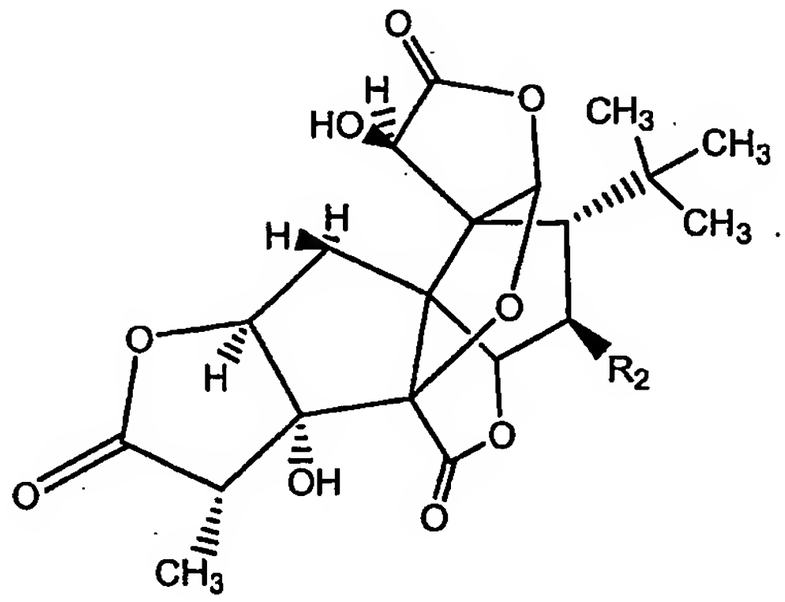
8. The composition of claim 7, wherein $R^3$ is *tert*-butyl.

9. The composition of claim 2, wherein for at least one compound of formula (I), $R^4$ is –OH.

10. The composition of claim 2, wherein for at least one compound of formula (I), $R^5$ is –OH.

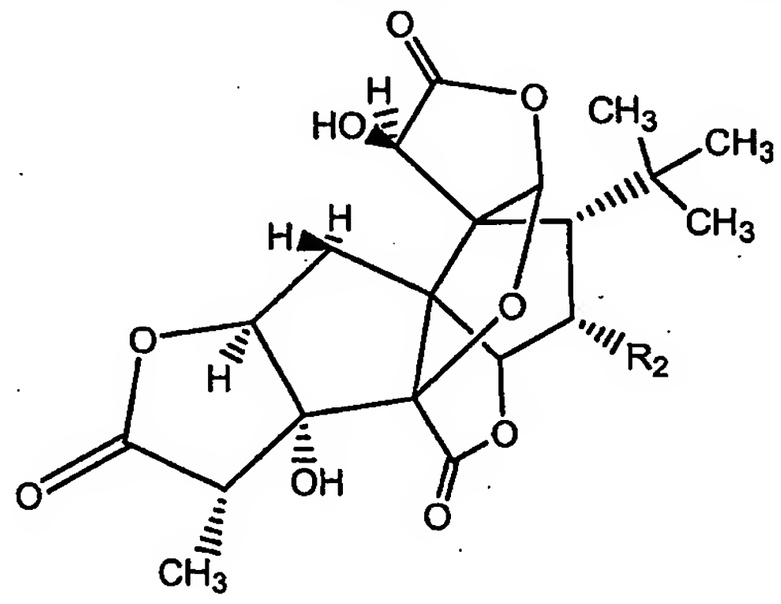
11. The composition of claim 2, wherein for at least one compound of formula (I), $R^2$ is –OH.

12. The composition of claim 2, comprising a compound having the formula:



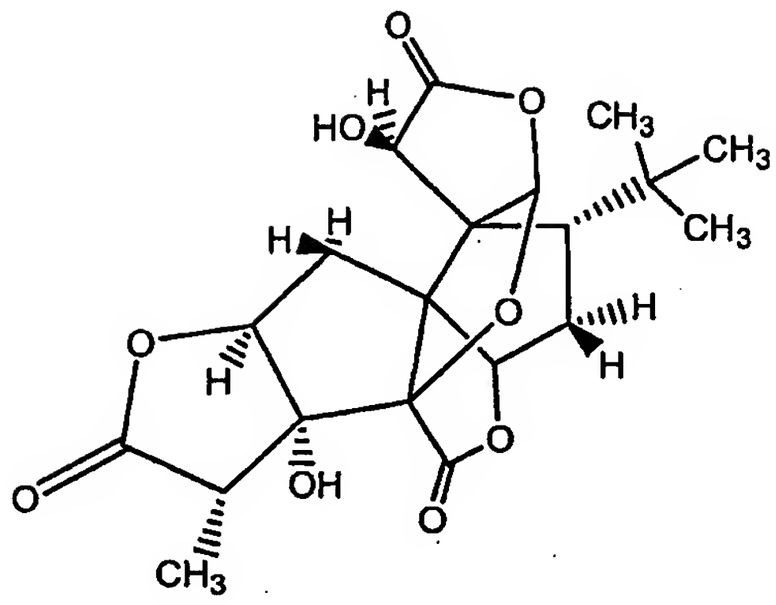
wherein $R_2$ is –H, -$C_1$-$C_5$ alkyl, -OH, -$NH_2$, -halo, -$C_2$-$C_5$ alkenyl, -$C_2$-$C_5$ alkynyl, -O-$C_1$-$C_5$ alkyl, -O-$C_2$-$C_5$ alkenyl, -O-$C_2$-$C_5$ alkynyl, -O-C(O)-$C_1$-$C_5$ alkyl, -O-C(O)-aryl, -O-CO-NH-$C_1$-$C_5$ alkyl, -O-$SO_2$-$C_1$-$C_5$ alkyl, or -O-$SO_2$-aryl.

13. The composition of claim 2, comprising a compound having the formula:

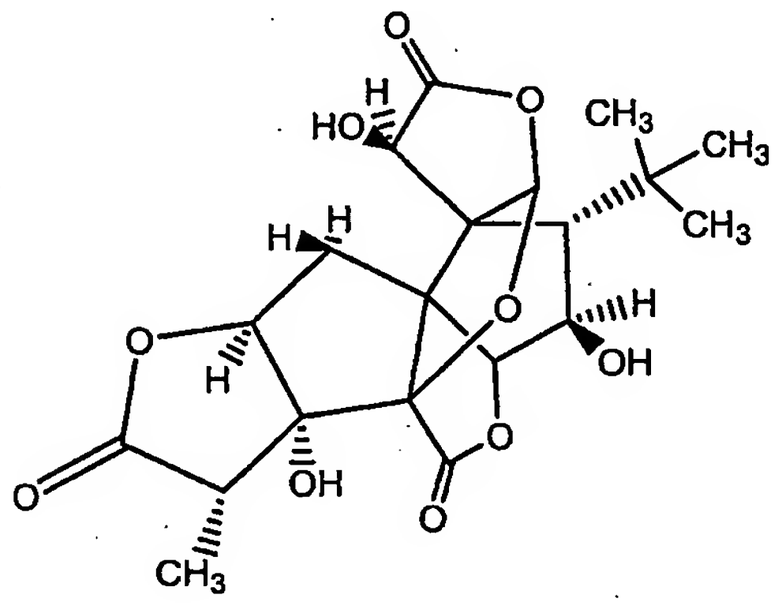


wherein $R_2$ is –H, -$C_1$-$C_5$ alkyl, -OH, -$NH_2$, -halo, -$C_2$-$C_5$ alkenyl, -$C_2$-$C_5$ alkynyl, -O-$C_1$-$C_5$ alkyl, -O-$C_2$-$C_5$ alkenyl, -O-$C_2$-$C_5$ alkynyl, -O-C(O)-$C_1$-$C_5$ alkyl, -O-C(O)-aryl, -O-CO-NH-$C_1$-$C_5$ alkyl, -O-$SO_2$-$C_1$-$C_5$ alkyl, or -O-$SO_2$-aryl.

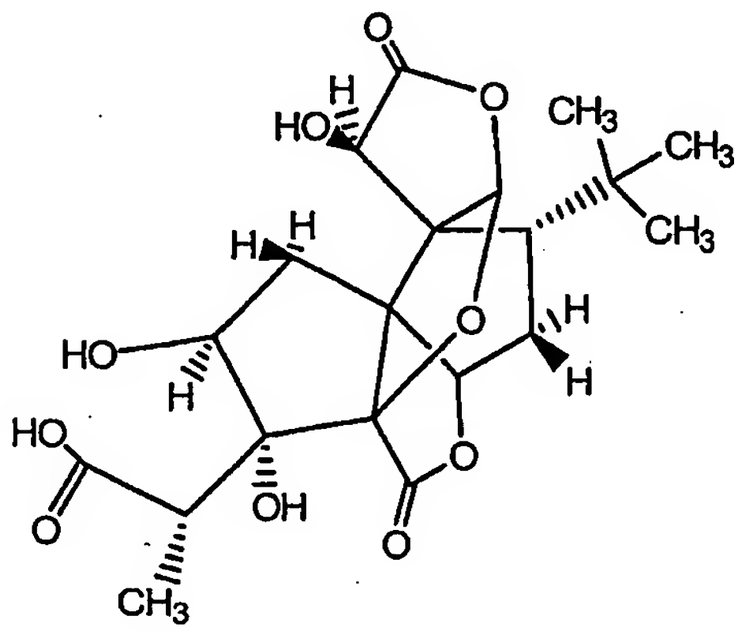
14. The composition of claim 2, comprising the compound having the formula:



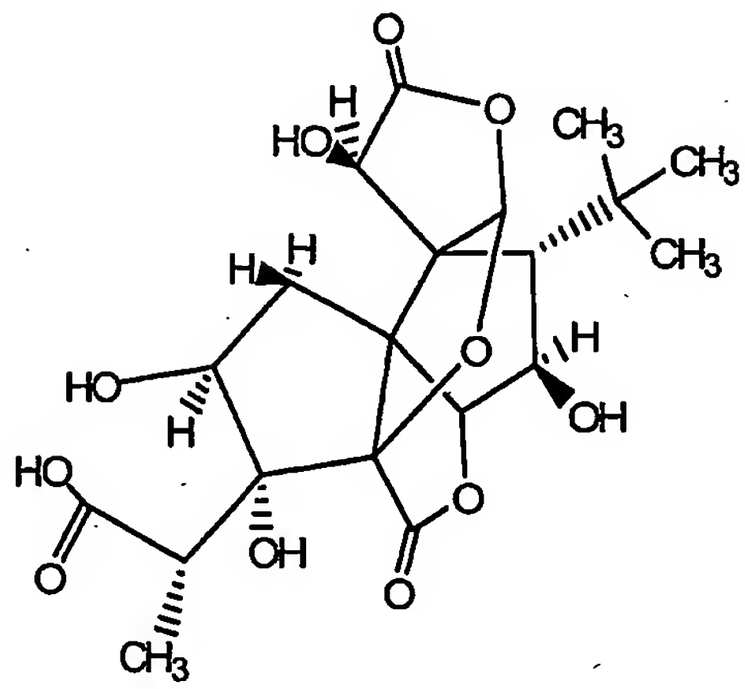
15. The composition of claim 2, comprising the compound having the formula:



16. A composition comprising the composition of claim 2 and the compound having the formula:



17. A composition comprising the composition of claim 2 and the compound having the formula:



18. A composition consisting essentially of Ginkgolide A and Ginkgolide J.

19. The composition of claim 2 or claim 18, further comprising an antioxidant.

20. The composition of claim 19, wherein the antioxidant is vitamin C, vitamin E, N-acetyl-L-cysteine, resveratrol, coenzyme Q, alpha-lipoic acid, lycopene, or any combination thereof.

21. The composition of claim 19, wherein the antioxidant comprises a biflavone.

22. The composition of claim 21, wherein the biflavone is amentoflavone, ailobetin, ginkgetin, isoginlgetin, sciadopirysin, or any combination thereof.

23. The composition of claim 2, further comprising a flavonoid.

24. The composition of claim 23, wherein the flavonoid is a flavonol glycoside.

25. The composition of claim 24, wherein the flavonol glycoside is quercetin, kaempferol, isorhamnetin, or any combination thereof.

26. The composition of claim 2, further comprising a pharmaceutical carrier.

27. The composition of claim 19, further comprising a pharmaceutical carrier.

28. The composition of claim 23, further comprising a pharmaceutical carrier.

29. A composition consisting essentially of ginkgolide A and ginkgolide J, wherein the composition is obtained using a process comprising the steps of:

(i) extracting Ginkgo Biloba plant material with ethyl acetate and filtering the resultant solution to provide a first filtered residue and a first filtrate;

(ii) diluting the first filtered residue with diethyl ether and filtering the resultant solution to provide a second filtered residue and a second filtrate;

(iii) diluting the second filtered residue with methanol and filtering the resultant solution to provide a third residue and a third filtrate;

(iv) concentrating the third filtrate and subjecting the resultant concentrate to chromatograpy under conditions sufficient to provide a first fraction containing a mixture of Ginkgolide A and Ginkgolide B, and a second fraction containing a mixture of Ginkgolide C and Ginkgolide J;

(v) combining the first and second fractions obtained in step (iv) and concentrating the resultant solution to provide a concentrate containing Ginkgolide A, Ginkgolide B, Ginkgolide C and Ginkgolide J;

(vi) diluting the concentrate obtained in step (v) with an organic solvent and contacting the components of the resultant solution with benzyl bromide in the presence of a non-nucleophilic base under conditions sufficient to provide a product mixture containing unreacted Ginkgolide A, unreacted Ginkgolide J, benzylated Ginkgolide B and benzylated Ginkgolide C;

(vii) subjecting the product mixture obtained in step (vii) to chromatography under conditions sufficient to provide a composition comprising Ginkgolide A and Ginkgolide J, wherein the composition does not contain any of: benzylated ginkgolide A, benzylated ginkgolide J, ginkgolide B, benzylated ginkgolide B, ginkgolide C or benzylated ginkgolide C; and

(viii) purifying the compsition obtained in step (vii) such that the purified composition consists essentially of Ginkgolide A and Ginkgolide J.

30. An extract comprising more than 10% terpene trilactones, wherein the proportion of terpene trilactones, by weight of the total amount of terpene trilactiones, is from about 52% to about 62% bilobalide, from about 10% to about 20% ginkgolide A, from about 5% to about 15% ginkgolide B, from about 5% to about 15% ginkgolide C, and from about 1 % to about 8% ginkolide J, and wherein the percentages of bilobalide, ginkgolide A, ginkgolide B, ginkgolide C and ginkgolide J add up to 100%.

31. An extract comprising more than 10% terpene trilactones, wherein the proportion of terpene trilactones, by weight of the total amount of terpene trilactiones, is from about 20% to about 30% bilobalide, from about 37% to about 47% ginkgolide A, from about 10 % to about 20 % ginkgolide B, from about 10% to about 20% ginkgolide C, and from about 1 % to about 8% ginkolide J, and wherein the percentages of bilobalide, ginkgolide A, ginkgolide B, ginkgolide C and ginkgolide J present in the composition add up to 100%.

32. The extract of claim 30 or 31, comprising about 65% terpene trilactones.

33. The extract of claim 30 or 31, comprising about 70% terpene trilactones.

34. A method of treating a neurological or neurodegenerative disease or disorder comprising administering to a subject an effective amount of the compound, composition, or extract of any one of claims 1-33.

35. The method of claim 34, wherein the neurological or neurodegenerative disease or disorder is Alzheimer's disease.

36. A method of treating a memory disorder in a mammal comprising administering to a subject an effective amount of the compound, composition, or extract of any one of claims 1-33.

37. A method of treating depression in a mammal comprising administering to a subject an effective amount of the compound, composition, or extract of any one of claims 1-33.

38. The method of claim 34, wherein the neurological or neurodegenerative disease or disorder comprises a neurodegenerative-related condition such as, but not limited to, multiple

sclerosis, amyotrophic lateral sclerosis, Alpers' disease, corticobasal ganglionic degeneration, multiple system atrophy, motor neuron disease, olivopontocerebellar atrophy, Parkinson's disease, prion disease, Rett syndrome, tuberous sclerosis, Shy-Drager syndrome, Huntington's disease, senile dementia, epileptic dementia, presenile dementia, post-traumatic dementia, vascular dementia and post stroke dementia, alcoholism, meningitis, neonatal hypoxia, stroke, global cerebral ischemia, or any combination thereof.

39. A method for treating neurological damage in a mammal comprising administering the compound, composition, or extract of any one of claims 1-33, in an amount effective to cause neurite out growth.

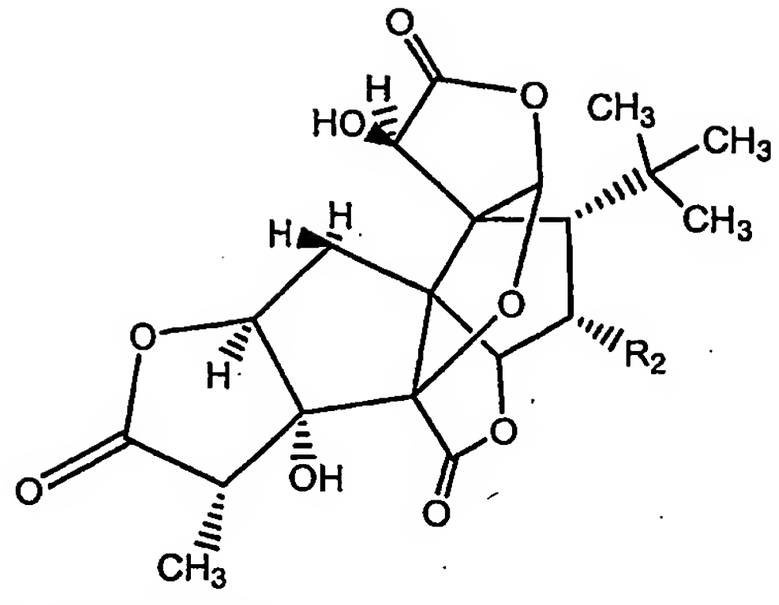
40. A method for protecting a neuron against neuronal cell death or long term potentiation impairment by beta amyloid protein comprising contacting the neuron with the compound, composition, or extract of any one of claims 1-33.

41. A method for stimulating axonal out growth of a neuron comprising contacting the neuron with the compound, composition, or extract of any one of claims 1-33.

42. A method of treating a neurological or neurodegenerative disease or disorder in a mammal comprising administering an enriched *Ginkgo biloba* extract comprising at least about 60% terpene trilactones.

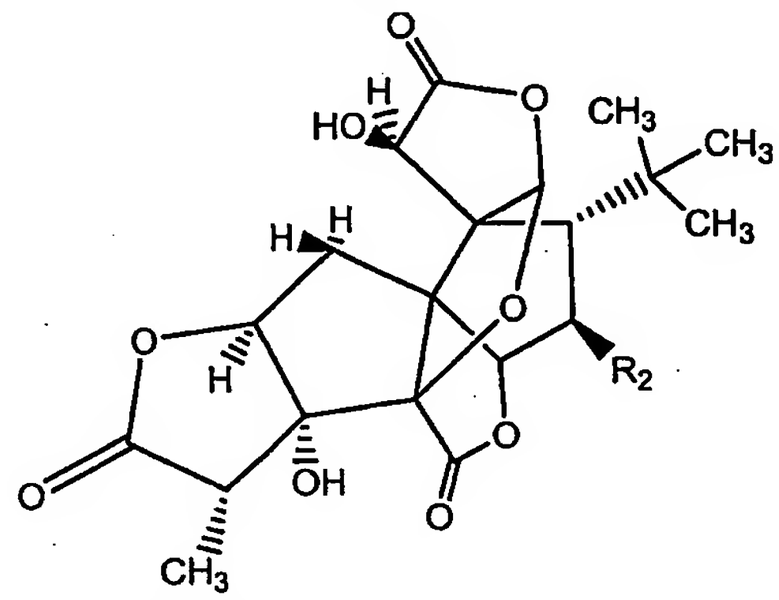
43. A method of protecting a neuron against neuronal cell death or long term potentiation impairment by beta amyloid protein comprising contacting the neuron with an enriched *Ginkgo biloba* extract comprising at least about 60% terpene trilactones.

44. A method of identifying a receptor that binds a compound that protects against neuronal cell death or long term potentiation impairment by beta amyloid protein comprising administering the phosphodiesterase inhibitorto a subject a compound having the formula:



wherein $R_2$ is a detectable moiety.

45. A method of identifying a receptor that binds a compound that protects against neuronal cell death or long term potentiation impairment by beta amyloid protein comprising administering to a subject a compound having the formula:



wherein $R_2$ is a detectable moiety.

46. The method of claim 44 or 45, wherein the detectable moiety comprises a photoactivatable moiety, a fluorescent moiety, or a radioactive moiety.

47. A method for treating Alzheimer's disease comprising administering to a subject a composition consisting essentially of a pharmaceutical carrier and an effective amount of the compound, composition, or extract of any one of claims 1-33.

48. A method for treating Alzheimer's disease comprising administering to a subject a composition consisting essentially of a pharmaceutical carrier and an effective amount of Ginkgolide J.

49. A method for protecting a neuron against neuronal cell death or long term potentiation impairment by beta amyloid protein comprising contacting the neuron with a composition consisting essentially of a pharmaceutical carrier and an effective amount of Ginkgolide A.

50. A method for protecting a neuron against neuronal cell death or long term potentiation impairment by beta amyloid protein comprising contacting the neuron with a composition consisting essentially of a pharmaceutical carrier and an effective amount of Ginkgolide J.

51. A method for stimulating axonal out growth of a neuron comprising contacting the neuron with a composition consisting essentially of a pharmaceutical carrier and an effective amount of Ginkgolide A.

52. The compound, composition, or extract of any one of claims 1-33 which is derived from a naturally occurring source.

53. The compound, composition, or extract of claim 52, wherein the source is the *Ginkgo Biloba* tree.